Large-Scale Snow Cover Monitoring with SeaWinds/QuikSCAT Scatterometer

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Global snow cover has profound interactions with the Earth's climate. The challenge is that global snow monitoring requires both large coverage and high temporal resolution because of the large-scale extent and the dynamic properties of snow. In this regard, a satellite Ku-band scatterometer such as SeaWinds/QuikSCAT is applicable to large-scale snow monitoring thanks to the very wide swath of the sensor resulting in a complete coverage of cold land regions two times per day.

This paper presents SeaWinds/QuikSCAT results on large-scale snow monitoring. Based on results from the Alaska snow field experiment (March-April 1999) investigating in detail the relationship between Ku-band backscatter and snow properties, we develop initial snow algorithms for application to SeaWinds/QuikSCAT data. We apply the algorithms to derive daily global maps of dry snow extent, wet snow zones, and snow melt/retreat over the global scale on the daily basis. SeaWinds/QuikSCAT snow results compared well with in-situ measurements from the global network of weather stations. Furthermore, time-series comparison of SeaWinds/QuikSCAT signature with seasonal snow field observations at Ivotuk, Alaska indicates the scatterometer can determine the local snow melt onset time, duration of diurnal melt-refreeze cycles, and snow departure time.

To present these results, we show the animation of global snow cover, the animation of global snow melt zones, and the direct comparison with time-lapsed photography from the Ivotuk snow field experiment. To derive the snow results, we have utilized more than 1 terabytes of data from SeaWinds/QuikSCAT data collected over a 1-year time period. Results reveal the anomalous warming event coincident with the 1999 winter solstice in Alaska, and the rapid sweep of snow melting across the Canadian Arctic archipelago in late spring of 2000.